

Using StereoCAT in ensemble mode

This page provides information on using the [StereoCAT tool](#) in ensemble mode and generating a control file to launch an ensemble simulation.

An ensemble is a way of generating a multitude of result sets (or “members”) (which are simulation inputs) from fewer manually-made measurements. This is used to generate a spread of possible CMEs for simulation.

StereoCAT ENSEMBLE MODE INSTRUCTIONS

1. Since ensembles are created after a regular single simulation has been completed, continue your StereoCAT session for the CMEs in question (save your sessions!). You will have already been following the usual instructions for measuring CMEs as outlined [here](#). You will have made several measurements with multiple spacecraft and time pairs to have a good idea of the parameter spread. Choose the spacecraft/time pair you are most confident in.

2. Click the magnifying glass icon of your **best measurement**. This will take you to the measurement screen. Click the "Results" button, then click "**Start Ensemble**" to enter ensemble mode (clicking it will transform the results dialog). Then click the “Add to Ensemble” button to save your current measurement to the ensemble (adjusts the counters at the bottom of the dialog). This will also reset the measurement handles, to force you to make each measurement from scratch, and guarantee their independence.

- *In ensemble mode N^2 result sets are generated from N measurements. As you add more measurements to the ensemble, the calculated members will grow as the square of the number, if you are using two spacecraft. This is because the program splits up the part of the measurement you made for each individual spacecraft, and recombines all of those partial measurements with partial measurements from other complete measurements you have saved.*

- *If you are using one spacecraft, you can only create an ensemble if you have entered an angle in the “angle from plane of sky to CME” field. You can get a similar effect of quadratic growth of the number of calculated measurements if you enter different possible angles here.*

- *If you would like to create an ensemble with no spacecraft computer combined measurements, complete measurements indicated in this step (2), then skip to step 4. In step 6 you can delete computer combined members and add custom members only.*

3. Begin making your **next measurements** making sure to follow the usual CME measurement guidelines. In particular, make sure you are measuring the same feature throughout all ensemble measurements, as they will be recombined with each other. If you want to run an ensemble with 48 members, make 7 measurements so you have $N^2=49$ members to choose from.

4. You can view all the handle positions you have specified by clicking the “View All Measurements In Ensemble” button. When you have enough calculated members, you can close the ensemble by hitting “**Finish Ensemble**”.

5. Go to the session screen, your N ensemble measurements will show up in the bottom of your “Two–Timepoint Measurements” table (save your sessions!). **IMPORTANT! use the CME activity ID (or CME start time) for each ensemble title.** Click the pencil icon to edit the ensemble title (default “Untitled Ensemble”).

6. Next to your ensemble title, click the arrow icon to toggle between viewing the N ensemble measurements and the N^2 members. Click one of the histogram buttons to view calculated member spread of speed, lat, lon, and half angle. **Edit your members** as follows:

- Add a Custom Member (plus sign icon) with your regular single simulation parameters if they are not reflected in the members.
- Keeping in rough shape of the distribution member parameters (using histogram buttons) the same, delete nearly identical members (check sign icon). The blue highlight means that those members will be included in the control file.
- Add custom members if needed. This is for the case when you have parameters that are not reflected in your ensemble. These can be from your original two–timepoint measurement table (by holding down alt, and dragging to the ensemble's title row), your best guess of possible parameters using the source location etc.
- Note: to make runs time–efficient choose a total number of members (excluding median) that is a multiple of 8. If you do not have additional custom members to add, delete computer combined members until you have a multiple of 8. It is recommended to have at least 25 members.

If you have multiple CMEs (up to five), repeat steps 2 though 6 for each CME.

7. Save your session file. Save your control file. For single CME ensembles click download arrow icon next to the ensemble title. For multiple CME ensembles click the download arrow icon at the very top of your session screen and select the CME ensembles.

Check that your control file has the correct CME IDs, and $NCMEMBERS = NCMES \times (\text{members}(\text{multiple of } 8) + 1(\text{median case}))$ (or check execution groups is $\text{members}(\text{multiple of } 8) + 1(\text{median case})$). (Custom members are indicated with an "H" flag (human), computer combined members with a "C" flag (computer), and the median member with an "M" flag (median)). To correct any mistakes, **do not edit this control file directly**, make the changes in your StereoCAT session, then resave your session and control file.